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ANTHROPOLOGY.

The Significance of Cranial Characters in Man. — Professor John Cleland has communicated to the Royal Society a paper in which he gives an account of some careful investigations into the cranial measurements of various races, and criticises the various methods of craniometry in use — pointing out what facts of growth and relations of parts the observed measurements really indicate. He observes that if the terms dolichocephalic and brachycephalic are to retain any scientific value as applied to skulls, the "cephalic index" (that is, the breadth in terms of the length which is called one hundred) must not be depended on. Other points of importance, as pointed out by Retzius, must be attended to. According to Dr. Cleland, the relation of the height to length of a skull is of great importance. There is no foundation whatever for the supposition, which is a wide spread one, that the lower races of humanity have the forehead less developed than the more civilized nations; neither is it the case that the forehead slopes more backwards on the floor of the anterior part of the brain-case in them than it does in others. — *Quarterly Journal of Science.*

Hereditary Genius. — In his late work on "Hereditary Genius," Mr. Francis Galton thus describes his purpose:

> "What I profess to prove is this: that if two children are taken, of whom one has a parent exceptionally gifted in a high degree—say as one in four thousand or as one in a million—and the other has not, the former child has enormously a greater chance of turning out to be gifted in a high degree than the other. Also, I argue that, as a new race can be obtained in animals and plants, and can be raised to so great a degree of purity that it will maintain itself, with moderate care, in preventing the more faulty members of the flock from breeding, so a race of gifted men might be obtained, under exactly similar conditions."

AMERICAN ASSOCIATION.

Nineteenth Meeting of the American Association for the Advancement of Science, held at Troy, N. Y., August 17th–24th. 1870. [*Abstracts of papers continued from the November Number.*]

Mr. F. W. Putnam made a communication "On the young of Orthagoriscus mola." He had been led to his investigations by the statement, made by Messrs. Lütken and Steenstrup,* that the young of Orthagoriscus differed greatly from the adult, and that Molacanthus was not a distinct genus, but simply the young state of Orthagoriscus. This statement of the distinguished Copenhagen zoologists led him to believe that they had not seen the young of Orthagoriscus and had been misled by the singular form of Molacanthus in considering that genus as the younger state of the sunfish. He exhibited drawings of *Molacanthus*, of the adult form of *Orthagoriscus mola* and *O. oblongus*, and of the young of the last two. The drawing of the young of *O. oblongus* was copied from Harting's work. Harting had figured the specimen in connection with remarks to the effect that he thought the young of this genus were not so different from the adult in form as supposed by Lütken and Steenstrup.

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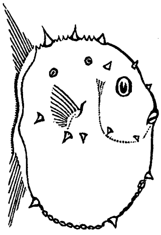
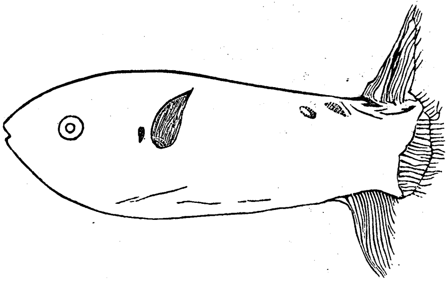
* Œfversigt Danske Vidensk. Selsk. Forhandl. 1863. p. 36.

Fig. 134.



Molacanthus Palassii (1-2 grown, natural size).

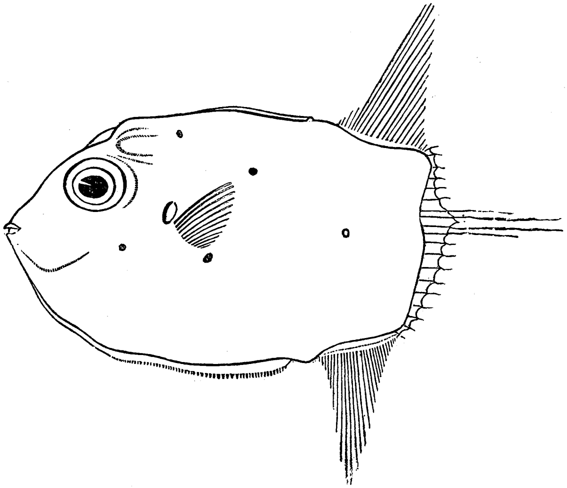
Fig. 135.



Orthagoriscus oblongus (young, natural size).

The drawings of the young of *O. mola* were from specimens taken in Massachusetts Bay and now in the Peabody Academy of Science, having been received from the Essex Institute in whose collection they had been for many years. These specimens, four in number, were about two inches in length, and while differing from the adult in several particulars were yet so near to the adult form in all their important features that no doubt could be entertained as to their being the young of *O. mola*. In these young specimens the eye is proportionally very large, and is placed at the margin of the head, while in the adult it is situated some distance from the margin. In the young the dorsal fin and the upper portion of the caudal

Fig. 136.

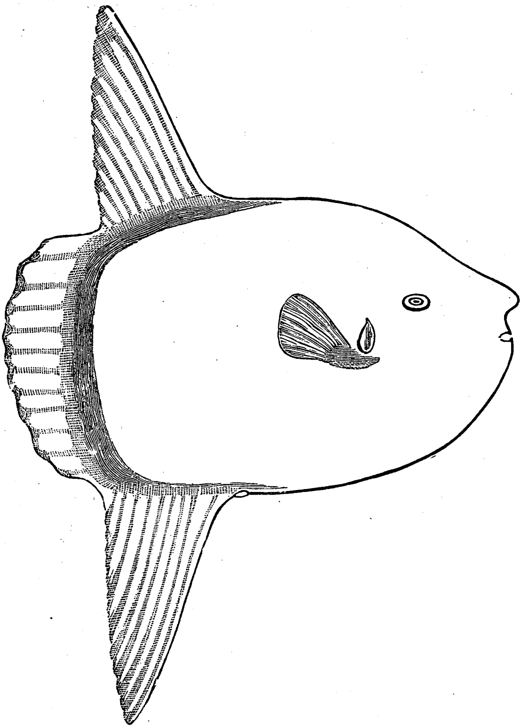


Orthagoriscus mola (young, natural size).

are thrown respectively a little backward of the anal fin and the lower part of the caudal. By following out a series of drawings, taken from specimens of various sizes, he showed how the growth of these fishes was more rapid in their dorsal and anterior parts than in other portions of the body, and that from the pushing forward of the posterior parts, and the tendency to develop a large head at the expense of the body, which culminated in the formation of the projecting "nose" so characteristic of the old specimens, he was led to the conclusion that the various forms of the short sunfishes were all of one species, and those of the oblong type of another; these two forms probably representing two distinct genera of one species each (perhaps two of the *mola* type).

In the young *O. mola* the caudal fin is composed of eight rays in its upper half and eleven rays in its lower half. These rays are elongated filaments, and by their regular increase in length as they approached the centre of the fin the caudal became a pointed fin. Along the ventral portion of these young fishes is a fleshy ridge, easily detached from the body, and armed with several rows of small spines. The back, for about half the distance in front of the dorsal fin, has a slightly raised fleshy ridge.

Fig. 137.



Orthagoriscus mola (adult, greatly reduced).

Several interesting points were mentioned in connection with the skeleton of the young and the changes which take place in its growth. The neural spines of the 5th to the 15th vertebræ are closely packed together with the interneural spines, and extending backwards support the dorsal fin, while the hæmal spines of the 10th to 16th vertebræ are in close connection with the expanded interhæmal spines supporting the anal fin. The 16th vertebra gives off large neural and hæmal spines, the former having five interneural spines anchylosed with it as in the adult, while the hæmal spine supports nine interhæmal spines, the lower one of which belongs to the anal fin while the others are of the caudal chain. In the adult only seven interhæmal spines **are** connected with this hæmal spine. The 17th vertebra in the adult lies in the caudal chain of interspinous bones and, from its being separated from the vertebral column, has been as often considered as an interspinous bone as a vertebra. In the young specimens this vertebra, though separated from the column as in the adult, has in close connection with it two bones above and two below, probably indicating that this vertebra is in reality the consolidation of two vertebral bodies, the 17th and 18th, while two other small (neural and hæmal) bones posterior to this free vertebra indicate that a 19th vertebra existed at an earlier stage. These six neural and hæmal (three each) bones disappear in the adult, and with them the central rays of the caudal fin, and they and the 17th, 18th, and 19th vertebræ are only represented by the free or "floating" 17th vertebra which lies in the chain of interspinous bones of the caudal. This is the only instance of a vertebra existing as distinctly separated from the vertebral column known to the author.

A dissection of the soft parts of the young shows the same arrangement as in the adult; the large liver extending in two lobes and enclosing the stomach and portions of the intestine, and the long intestine with its five or six folds. The arrangement of the bundles of muscles is the same as in the adult.

On comparing these young with Molacanthus an entirely different structure is observed. First, the external form of Molacanthus differs greatly from Orthagoriscus; the body is deeper than long in Molacanthus, while the reverse is the case in Orthagoriscus. There are many largely developed spines on the former, and the skin is thin, silvery and smooth between the spines. In the latter the skin is thick, the anterior portion is protected by small granulations and the rest is covered with fine villous scales; there are five singular naked spaces on each side, three of which have a raised granulated margin, and there is a similar raised space just in front of the dorsal fin. In Orthagoriscus the dorsal and anal are closely connected with the caudal, which, in comparison with the adult, is largely developed in the young, while in Molacanthus no caudal fin can be traced, and the dorsal and anal are separated by a naked space (though all the figures of this fish thus far published represent the dorsal and anal as united by a caudal, the row of small dermal spines at this portion having been mistaken for rays). The skeleton of Molacanthus shows the interspinous bones of the dorsal in connection with the neural spines of the 4th to 17th vertebræ, and those of the anal with the hæmal spines of the 10th to 17th vertebræ. The vertebral column in Molacanthus terminates abruptly with the 17th vertebra, and no caudal chain of interspinous bones can be traced. The liver is small, when compared with that of the young Orthagoriscus, and is composed principally of a large right lobe overlying the stomach. The stomach is small and the intestine is short, making but two turns, like the letter S, while in Orthagoriscus it is long and has five or six turns, or coils. The arrangement of the muscles and the bones of the head are, in general, about the same as in Orthagoriscus.

Figure 134 is from a specimen of *Molacanthus Palassii*,* natural size. This specimen was taken from the stomach of a dolphin caught in the North Atlantic and belongs to the Boston Society of Natural History.

Figure 135 is the young of *Orthagoriscus* (*Cephalus*) *oblongus*, copied from Harting's Memoir. This specimen was taken from the stomach of a "Thon" caught in the Atlantic Ocean, and is represented of natural size.

Figure 136 is from one of the young specimens of *Orthagoriscus mola* taken in Massachusetts Bay. Natural size.

Figure 137 represents the adult form of *Orthagoriscus mola* from a drawing of a specimen taken in Massachusetts Bay in 1856. Length forty-two inches; width from tip of dorsal to tip of anal sixty-four inches. This specimen was fully developed and shows the characteristic "nose" of the older individuals, the backward position of the eye and the position of the fins. None of the published figures of the adult are very correct in their outline. The best is that of Harting, under the name of *Orthagoriscus ozodura*, in the Transactions of the Academy of Amsterdam for 1868. An intermediate stage between the young and the adult, here figured, is represented by the figures of Bloch, Donovan, and Yarrell.

Dr. R. H. Ward read a paper before the Section of Microscopy "On the Illumination of Binocular Microscopes." The object of this paper is not to add anything to the facilities at the command of specialists in microscopy, whose devotion to narrow branches of study, often accompanied by ample means to command every assistance within the skill of the opticians, has brought into existence the sumptuous first-class stands and their elaborate accessories, but to make some suggestions in the interest of that larger class, microscopical amateurs, who, incidentally to other occupations, use the instrument for the general study of natural history. Such persons usually, and wisely, buy the smaller instruments of the market, and their choice of apparatus, and consequent success in work, depends much upon the chances of trade and the interested partiality of dealers.

It is not strange, but unfortunate, that this class of apparatus, students' microscopes, *et id omne genus*, should latest and least feel the control of real science in their construction. Only a few years ago in London, and much later in this country, was there any serious effort to make students' microscopes worthy of the times. Even now some of the best of these are sold without a diaphragm below the stage, or with so small a body that the lowest (and, for beginners, best) eye-piece gives a ridiculously small field, and too many are still built upon the old vertical plan which has been obsolete for twenty years. In regard to stereoscopic microscopes the case is still worse. Tolles' binocular eye-piece "for microscopes only" is not yet in the market, though expected for years, and Wenham's binocular, long since popularized in England, is nearly unknown here except on large and costly instruments. Grunow, of New York, has done something during past years to furnish small binocular instruments. When will he, and Tolles, and Zentmayer, and Miller, and McAllister, and others, do for us what Crouch, and Collins, and Murray and Heath, and Beck, and many others, have long since done for England in supplying an abundant variety of good binoculars of moderate size and cost? If the binocular microscope were unnecessary for anybody it would be for the diatomist; yet I can scarcely believe that such a person, after seeing a Möller's type plate properly illuminated under a 4-10 objective of 110° or 120° in a good binocular, would ever advise any person to purchase a monocular instrument except as a necessity of price. While we are waiting for still further improvements in the binocular, promise of which may be seen in Mr. Holmes' bisected lens, the erecting binocular of Mr. Stephenson, and the binocular by double refraction of Dr. Barnard, let the contrivances already available, Wenham's for low and medium powers, and Tolles' for high powers, be made to do all the good they can do.

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*The synonymy of these fish will be discussed in full in the Memoirs of the Academy. The names now used are those under which the species are most generally known.

Mr. Putnam's paper will be published in full in a future number of the Memoirs of the Peabody Academy of Science, with several plates, illustrating more fully the points mentioned in this abstract.

We should take care that in simplifying our apparatus we do not gain simplicity at the expense of convenience. Of the three elements in microscopical work, the object, the amplifiers, and the light, the latter is the most difficult to handle and is least satisfactorily provided for. If any one accustomed to use a microscope which has no control of its light except by a mirror and diaphragm, will temporarily replace the diaphragm by a sliding tube capable of holding his highest power eye-piece and of focusing it from below upon the object, he will be little likely to use the instrument afterward in any other way. A Kelner's eye-piece, suggested as a condenser by Mr. Brooke, and urged by Dr. Beale, would be still better; and probably Tolles' orthoscopic eye-piece would answer the same purpose. The illuminating angle would be varied by focussing below the object, with much less loss of definition than in the old style of using an objective for the same purpose; or, preferably, various stops of blackened card would be introduced below the field-lens to stop off any desired portion of the light, and similarly a disc of blue glass would be used to correct the yellow glare of artificial light. With slight mechanical ingenuity the student can combine these stops in a circular diaphragm of blackened card or brass, and somewhat increase the convenience of his really excellent achromatic condenser. The efficiency of his apparatus will be vastly increased by adding the graduating diaphragm made by Collins and others in London and occasionally offered for sale in this country. Or, at a very reasonable expense, he can order the Webster condenser and graduating diaphragm complete of Collins or Crouch, or other London dealers. At first sight it would seem that this apparatus could not be used on stands of the "Jackson" model; but, by a little judicious filing, it can be used on large stands of this style, as I have been accustomed to do for years. After using a graduating diaphragm in the ordinary microscopical work of natural history, the orthodox wheel of apertures, with its intermittent views of the object, and its abrupt changes of light, seems simply absurd. For use without a condenser, or with one of the large lens or eye-piece form, Collins' graduating diaphragm should be used on all stands to which it can be applied; otherwise, and especially with the small lens or objective form of achromatic condenser, Zentmayer's graduating diaphragm should be used, or Brown's iris diaphragm as made by Beck. There is often some difficulty in getting the graduating diaphragm sufficiently near to the lenses in the small lens condensers, but none in the eye-piece condensers.

The easiest and most fascinating use of the stereoscopic microscope is doubtless with opaque or translucent objects with the paraboloid or other means of black-ground illumination. In lighting transparent objects under the binocular we have only one new condition introduced, the necessity of a wide horizontal illumination in order to give an even light over the whole of both fields. Focussing the condenser upon the object and gradually opening the diaphragm, we shall probably find, with a 1-inch of 25°, the best definition and resolution accomplished just at the point where both fields are fairly lighted; but with a 1-2 of 60° or a 1-4 of 75° the best definition is often gained when each field is scarcely half illuminated, and when the fields are wholly lighted the object is nearly drowned. If we now open wide the diaphragm, and introduce a blackened card disc punched with two holes (Plate 5, fig. 5) so as to give two cones of light each having an angular width about one-half or one-third of that of the objective, and converging horizontally upon the object at an angle nearly as great as that of the objective, we shall have both fields fairly and evenly lighted, and no glare. The same end is attained by a stop with a horizontal slit, giving a wide horizontal and narrow vertical pencil of light.

This expedient may be applied with some advantage even to instruments without accessories, by placing a disc like Fig. 1 of Plate 5, having an opening of suitable width, over the diaphragm, to shape the cone of light from the concave mirror; or the regular wheel of apertures may be replaced by a somewhat larger one containing one or two openings of this shape.

Next comes the spotted lens, which may be applied to any microscope and which will greatly increase its working power at an almost nominal expense, giving sufficiently good black-ground and oblique-light effects for small microscopes. This lens is used for transparent illumination of both fields of the binocular with 1-2 or 1-4-inch objectives (the Webster condenser, with its smallest centre stop, and graduating diaphragm, attains the same end in a much finer manner), but much of the light passed even by it is detrimental, and its performance may be improved by a cap of card or paper, placed over it, having a horizontal opening, or a vertical stop (Plate 5, figs. 2 and 3), one of the openings in Fig. 3 being closed when oblique light is required. A horizontal opening of adjustable width may be easily combined with the brass mounting of the spotted lens.

In using an objective or similar combination as achromatic condenser the horizontal slit is still more applicable. It (Plate 5, fig. 4) may be added, for instance, to the stop-plate of Powell and Leland's achromatic condenser, or placed in the supplementary aperture of Ross' 4-10 condenser, or in small microscopes screwed in between the lenses of a condensing objective. Different stops must be used for different angles of width required, 25° or 30° being generally applicable and the length being regulated by the diaphragm-plate, or by Zentmayer's graduating diaphragm, or Brown's iris diaphragm which, instead of the diaphragm-plate, should be combined with condensers of this class.

But the real value of this stop, and the real ease of handling the light in the every-day work of the stereoscopic-microscope, is attained with the large-lens condensers, with which a 1-4 of 75°, or, when more resolving power and less depth of field is required, a 4-10 of 110° to 120°, can be as easily managed as a 1-inch, both fields being softly and evenly lighted. Paper discs like Plate 5, fig. 5, may be used, adapted to various powers and placed between the lower lens of the condenser and its stop-plate, or Plate 5, fig. 6, may be placed in the same position, or the stop-plate may be so modified as to furnish a horizontal slit as in Plate 5, fig. 7, the length of the slit being controlled by the graduating diaphragm. An adjustable slit may be extemporized by using a straight edge of card in connection with the oblique stop of the stop-plate; or it may be combined with the brass-work as a pair of shutters somewhat like those of the spectroscope, or as a supplementary wheel, like Plate 5, fig. 8, above the usual stop-plate. The large round opening in this plate (Fig. 8) should be furnished with a rim to carry any experimental stops of blackened paper that may be desired. If the two plates are of exactly the same size and properly mounted at the centre, there is not the slightest difficulty in moving each independently of the other; nor is the unequal width and curved direction of the slit any serious inconvenience in practice.

The graduating diaphragm, for facility of use and certainty of results, has fairly superseded the original wheel of apertures; perhaps the time may come when we shall equally discard the wheel of stops, and have nothing left to remind us of our circular diaphragm-plate. If the opticians would give us something having the general arrangement of the

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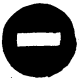

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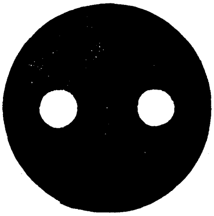

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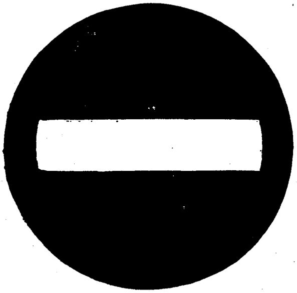

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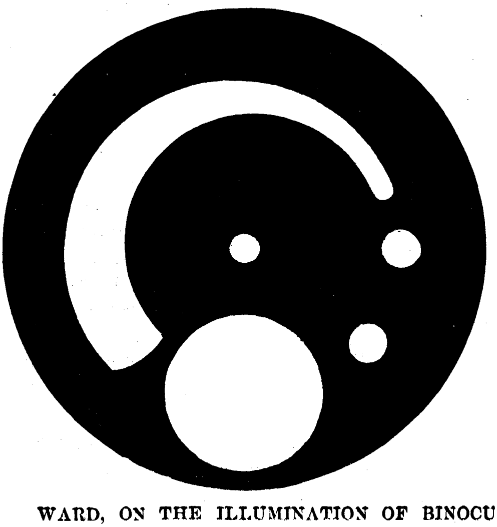

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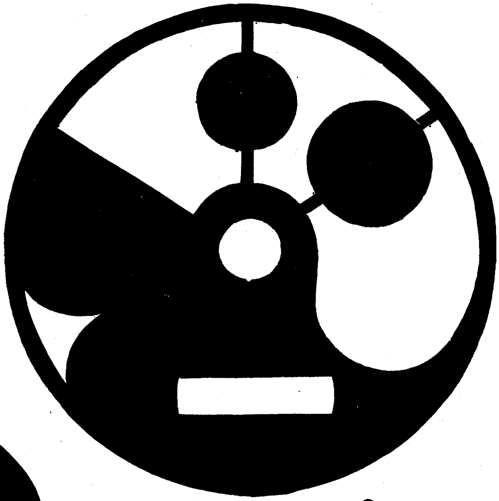

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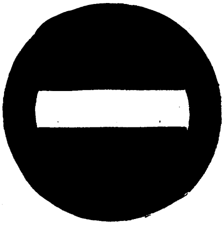

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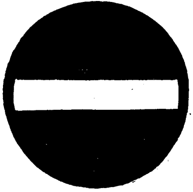

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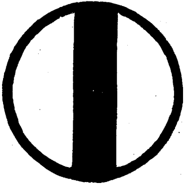

WARD, ON THE ILLUMINATION OF BINOCULAR MICROSCOPES.

Webster condenser, but of 110°, perfectly achromatic and adjustable for thickness of the glass slide, and mounted over a graduating diaphragm, a pair of shutters for an adjustable horizontal slit (one of them, or another single shutter, capable of moving independently for oblique illumination), and a graduating centre stop capable of stopping off from 25° to 80° of light, I believe that most persons who use the instrument for the ordinary investigation in natural history would consider the combination rather as a necessary part of their stand than as an accessory to be sometimes used with it.

Dr. WALKER of New Orleans, La., read a paper prepared by Professor EUGENE W. HILGARD, State Geologist of Louisiana, on "The Upper Delta Plain of the Mississippi." The paper is one of a series by the same author, the preceding ones having treated of the older formations which characterize the geology of the Great Enlargement of the Mexican Gulf Basin, of which the Mississippi River, below Cairo, forms the axis. We are first reminded of the successive disappearance of the slightly dipping formations, in proceeding south from Vicksburg. It is shown that the delta or alluvial deposits proper, cover the older formations to a comparatively slight depth only, the river running on paludal deposits, and then on an ancient sea bottom, of corresponding (late quaternary) age, from above New Orleans to near its mouth. It thus appears that Artesian bores in the vicinity of New Orleans, tubed through the (chiefly marine) deposits of the upper strata, and penetrating the great beds of Orange sand, or southern drift, will probably furnish an abundant rise of the best of water. The great torrent which produced the northern drift is seen to have swept over the southern coast with sufficient force to transport pebbles of five to six ounces weight from far distant regions, the nearest being Tennessee and Arkansas. This great eroding agent seems also to have so cut and worn the older formations into ridges and channels, that the overlying ones vary greatly in thickness, while level at the surface. The singular phenomena known as the New Orleans Gas Wells, are also mentioned. When bores were sunk for water, the gas rushed up with such force as to carry up several cart loads of sand in a single night, and when the gas became ignited, it was extinguished with great difficulty.

An abstract of a second paper by the same author, "On the Mudlumps of the Passes of the Mississippi," was given by Prof. J. E. HILGARD. The Mudlumps are islands formed by upheavals of the bottom, off the mouths of the Passes, inside the bar. They often rise in mid-channel, obstructing navigation and diverting the current, and at times bringing up objects long ago lost from vessels. They form a number of pretty large islands, especially near the mouth of the South-west Pass. On them we frequently find springs of liquid mud, accompanied by bubbles of combustible gas; these springs often exhibit all the phenomena of mud volcanoes — extensive cones of mud, with an active crater in the middle. Most of the material of the Mudlumps seen above water, bears evidence of having once belonged to active cones, now extinct.

The author investigated the origin of these springs, by an examination of their ejecta — gas, water, and mud. The gas he found to be such as is produced by vegetable matter in its first stages of decay. The mud contains evidence of a mixed fluviatile and marine origin; while the water in which it is diffused, has the composition of sea-water changed under the influence of ferrugino-calcareous river mud, containing fermenting vegetable matter.

The conclusion reached is, that the mud is the same as that which is deposited on the "blue clay bottom" of the Gulf, outside the bar, in a semi-fluid state. In its annual advance, the bar covers this mud stratum, which exists equally higher up the Passes; the increase in weight by vegetation, alluvion, etc., of the new formed land above, as well as that of the bar below the mouth, causes the bottom to bulge upwards at the points of least resistence, *i. e.* in the deepest channel.

Attention was called to the fact, that of all rivers known, the Mississippi is the only one exhibiting either mudlump action, or the peculiar narrow lands of bank, advancing rapidly towards deep water, which are known as "necks," and are obviously dependent on the mudlumps for their origin. It is therefore permissible to infer, not only that all the similarly shaped alluvions above the head of the Passes, at least as far as the forts, have been formed by mudlump action, but also that the latter will cease so soon as the bar, in its advance, shall pass beyond the shelf of "blue clay botton" (presumably of the Port Hudson age), into the deep water of the Gulf; which point is now nine miles out from the mouth.

Professor W. C. Kerr read a paper on "A Point in Dynamical Geology." This paper called attention to the agency of the sun as a probable and sufficient explanation of the well-known remarkable coincidences of the coast lines, mountain systems and chains of islands, — nearly all the great "feature-lines" in the physiognomy of the globe,—with the arcs of great circles tangent to the polar circles; the exceptions being generally arcs of great circles perpendicular to the former; inasmuch as the sun oscillates about (within 1° of) a position (± 22 1-2° declination), which is approximately polar to the above system of great circles, for *more than one quarter of the year;* and all the solar influences, mechanical (tidal), thermal, electromagnetic and chemical, being in full play for this long period, about this great dynamical plane which separates the luminous from the dark hemisphere, could not conceivably have failed to exercise a profound influence in outlining the rising ("becoming") features of the globe in its plastic and formative state. Similar considerations are applicable to the lunar influence, which was cumulative in the same direction.

The Oneonto and Montrose Sandstone, etc. — In the Report of my paper on the Oneonto and Montrose Sandstone etc., the language may convey the idea that the sandstones of both these localities have been identified with the Portage Group, which was not intended. The Oneonto Sandstone is pretty clearly an equivalent of the Portage Group of Central and Western New York, while up to this time no positive determination has been made regarding the Sandstone of Montrose. The latter may be the equivalent of the Red Sandstone of Tioga and of the summits of the Catskill, but we have not yet the facts necessary for the determination. Will you have the kindness to make some note of correction in the next number of the NATURALIST. Yours, etc. — JAMES HALL.

The following papers were also read before the Association: —

PAPERS READ IN SECTION B. — NATURAL HISTORY.

Notes on Granitic Rocks. By *T. Sterry Hunt.*

On the Oil-Bearing Limestone of Chicago. By *T. Sterry Hunt.*

On the Lignites of West America, their Distribution and Economic Value. By *J. S. Newberry.*

On the character of the Observations necessary to interpret the record of the last Glacial Period. By *N. S. Shaler.*

Microscopic Circuits of Generation: *a.* Of Zymotic Fungi: *b.* Of the (nominal) Genera of Fresh water Algæ, as development-phases of Bryaccæ, etc. *c.* Of Vorticello-Planarians. By *T. C. Hilgard.*

The Genetic Relations of the Arietes. By *Alpheus Hyatt.*

On the occurrence of native iron, not meteoric. By *H. B. Nason.*

On the salt deposit of Western Ontario. By *T. Sterry Hunt.*

On the Relation of Organic Life of the several continents to the Physical Character of those land areas. By *N. S. Shaler.*

The Development and Old Age of the Tetrabranchiate Cephalopods. By *A. Hyatt.*

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